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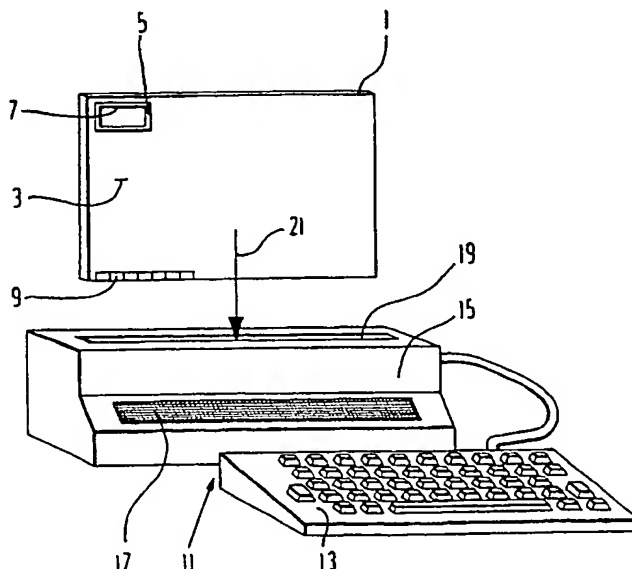
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(54) **Method of identifying X-ray film with patient data as well as X-ray film cassette and unloading and loading apparatus for X-ray film cassettes.**

(57) An X-ray film cassette (1) comprises as data carrier for patient data an LCD-unit (5) with a display (7) visible from the exterior of the cassette. The LCD-unit (5) has memory characteristics so that the data remain visible in the display (7) on cassette (1).

The data are automatically transferred from display (7) onto the X-ray film by reflex exposure when cassette (1) has been opened for unloading of the X-ray film.



**EP 0 443 372 A2**

The invention relates to a method of identifying X-ray film with patient data wherein an X-ray film cassette and a patient data carrier associated with said cassette are used and wherein the X-ray film is exposed image-wise in an identifying exposure to a pattern representing the data of the data carrier. The invention also relates to an X-ray film cassette as well as an unloading and loading apparatus for X-ray film cassettes.

DE-PS 29 46 078 discloses a method wherein an X-ray film cassette is used which has a window which can be closed in a light-tight manner, as known e.g. of a commercially available X-O-matic cassette.

In the case of that method, wherein the identifying exposure is carried out by means of a projection unit through the open cassette window, the film can be incorrectly identified in that the wrong data carrier is erroneously supplied to the projection unit or in that the operator erroneously inserts into the projection unit an incorrect film cassette which does not belong to the data carrier located in the projection unit.

It is the object of the invention to provide an identification method of the type concerned which offers maximum protection against incorrect identification.

In accordance with the invention this object is attained in a method of the above-mentioned type in that the data carrier used is an LCD-unit with memory characteristics, which is provided on the cassette and can be addressed from the exterior of the cassette and in that the data are machine read from the data carrier and converted into control signals by means of which the identification exposure of the X-ray film is controlled.

By using, in accordance with the invention, a cassette which contains the data carrier as an integral component the danger is excluded of the data carrier and the cassette being incorrectly associated. Since moreover the data carrier used is an LCD-unit addressable from the exterior of the cassette a further possible source of error can be excluded which consists in that a set of data is read into the data carrier which is not adapted for the cassette concerned. This danger is avoided in the case of the invention because the patient data can be read into the LCD unit directly during actual use in that exterior control contacts of the cassette are addressed for reading in of the data while the cassette is positioned in an X-ray apparatus for the radiographic exposure of a part of the body of the patient. For this purpose the X-ray or radiographic apparatus may have on its cassette chamber a contacting means which cooperates with the control contacts of the cassette.

Due to the further feature of the invention, namely of the data being machine-read from the

data carrier and used for the identification exposure of the X-ray film, the further source of error in the case of the prior art which consists of incorrectly associated data being recorded during the identification exposure, is also excluded by the invention.

In the case of a liquid crystal with a nematic phase, the memory characteristic of the LCD-unit can be attained by a withstand voltage which is made available by a power supply provided on the cassette, for example, a small built-in battery.

The use of an LCD-unit with a smectic phase (type SMECTIC A) which has memory characteristics is particularly advantageous. In such a case no batteries are required in the cassette in order to secure the data read in by addressing the cassette from outside. The data can be read out until the LCD-unit is addressed once again for the erasure of the data.

If a cassette is used in which the LCD-unit is visible on the outside wall an additional advantage is attained; the data read in form a mark on the cassette which is visible from outside. When the data are read in in the course of a radiographic exposure, the operator can see immediately whether the X-ray film located in the cassette has already been exposed, which is the case if data are displayed by the LCD-unit.

Depending on the organization of the hospital or doctor's office, the data can be read into the LCD-unit in different ways. If the patient data are, e.g. stored in the PC system of the hospital, the set of data can be retrieved from the PC terminal when an X-ray exposure is made and read into the film cassette placed in the X-ray apparatus. If, on the other hand, each patient has a patient ID-card, a card reader can be provided in connection with the X-ray apparatus. The patient's ID card is inserted into the card reader which reads the set of data into the LCD-unit of the cassette, for example, by reading out a magnetic strip or the like on said ID card. The control can be such that the X-ray exposure can be actuated only after, or only simultaneously with, the reading in of the set of data.

It is also an object of the invention to provide an X-ray film cassette with a data carrier into which patient data can be read, said cassette being suitable in particular for carrying out the method according to the invention. In accordance with the invention this object is attained in that the data carrier of said cassette is an LCD-unit having memory characteristics (type SMECTIC A) and in that control contacts accessible from the outside wall of the cassette are provided by which the LCD-unit can be addressed from the exterior of the cassette for the reading in, and erasure of, patient data.

The LCD-unit is preferably located on the outer wall of the cassette such that the data read in are

visible on the outer side of the cassette.

It is moreover an object of the invention to provide an unloading and loading apparatus for X-ray film cassettes with a patient data carrier, said apparatus being suitable for carrying out the method according to the invention and having a light-tight inner space as well as means for opening X-ray film cassettes located in said inner space, means for removing the exposed X-ray film from the open cassette, means for inserting another X-ray film into the open cassette, and means for developing the X-ray film removed from the cassette.

According to the invention such an unloading and loading apparatus is characterized in that it contains an exposure station for imagewise identification exposure of the X-ray film of the open cassette and in that the exposure station is controllable by control signals of a data reading apparatus by means of which the patient data can be read out from the data carrier of the cassettes.

The data reading apparatus used may be a conventional type of scanner. Preferably a scanner means is used by which alphanumerical data can be read out from the LCD-unit which forms the data carrier of the cassettes.

The exposure station of the unloading and loading apparatus may include a writing head with an LCD-unit controllable by control signals of the scanner means for imagewise identification exposure of the X-ray film.

The invention will now be described in further detail with reference to the drawing.

The single figure shows a perspective and schematically simplified view of an X-ray film cassette comprising a data carrier as well as a means for reading in patient data into said data carrier of the cassette.

Disregarding the special type and arrangement of the associated data carrier, an X-ray film cassette 1 is designed in the way typical of such cassettes. It has a cassette housing which can be opened and closed and in the interior of which an X-ray film, possibly with intensifying screens, can be accommodated in a light-tight manner. In one corner of the broad side of cassette 1, a data carrier in the form of an LCD-unit 5 is arranged on the outer wall 3 such that its display 7 is visible from the exterior of the cassette without an opening being provided in the outer wall 3. The LCD-unit 5 is of the type having memory characteristics. Such characteristics are exhibited by an LCD-unit of the SMECTIC A type as used in the case of the present embodiment.

In the case of such an LCD-unit, a crystal orientation caused by electric addressing is maintained even after the control voltage has been switched off. The information read in and stored

due to the unchanged crystal orientation is erased when the unit is again electrically addressed by a voltage of opposite polarity. In order that the LCD-unit 5 can be addressed and data can be read into it, which appear in the rectangular display 7, and in order that the data read in can be erased, the LCD-unit 5 comprises a number of control contacts 9 which are accessible at the edge of the outer wall 3 of the cassette 1, i.e. contacted from the exterior of the cassette. The control contacts 9 are associated with a suitable display matrix of display 7 which e.g. allows the data to be alphanumerically represented by means of a seven segment display or a dot matrix.

Thanks to the memory characteristics of the LCD-unit 5 no power supply (battery) for the LCD-unit 5 is required on or in cassette 1 because as was mentioned before, the data read in are maintained in the display 7 after the LCD-unit has been addressed via the control contacts 9, until it is again addressed via the control contacts 9 with an erasing voltage.

A data processing unit generally denoted 11 comprises a data input keyboard 13 of the usual type as well as a read-in unit 15. The latter includes a temporary storage means as commonly used in data processing units, said data storage means being adapted to receive a plurality of lines of data, as well as an LED display field 17 in which the data of the temporary storage means are visible. Moreover the unit 15 has an insertion slot 19 into which cassette 1 can be inserted as shown by an arrow 21 in the Fig. When the cassette is inserted the control contacts 9 are brought into contact with complementary contact pieces of unit 15, through which the LCD-unit 5 is addressed such that the data entered into unit 15 and visible in the display field 17 are read into the LCD-unit 5 by means of a control device (controller) which is located in unit 15 and adapted for the LCD-unit 5 so that the data are visible in display 7. They remain visible even after cassette 1 has been withdrawn from slot 19. After cassette 1 has been radiographically exposed in an X-ray apparatus for the medical purpose desired, cassette 1 is transferred in the usual manner to an unloading and loading apparatus. In the light-tight inner space of said apparatus, cassette 1 is opened for unloading of the exposed X-ray film, whereupon the exposed X-ray film is transmitted to a processor unit for development, and another X-ray film is inserted into the cassette before the cassette is closed again and dispensed from the unloading and loading apparatus for another use. An example of such apparatus which are also known as multiloader is commercially available under the designation "Multiloader 700". Since the unloading and loading apparatus to be used for carrying out the invention

corresponds more or less to the multiloaders commonly used, it has not been illustrated in the drawing.

The unloading and loading apparatus differs from the commonly used multiloaders only in that it includes the following additional means for carrying out the invention:

- a) a scanner unit serving as a data-reading apparatus
- b) an exposure station, and
- c) an erasing station.

The data-reading apparatus is a conventional type of scanner by which the data in the display 7 of the LCD-unit 5 can be read out and converted into electric control signals. The scanner may be arranged at the insertion slot of the unloading and loading apparatus such that the display 7 is scanned when cassette 1 moves into the unloading and loading apparatus.

The exposure station preferably comprises an LED-writing unit controllable by the control signals of the scanner for imagewise exposure of the X-ray film. The writing unit is preferably associated with the cassette-opening mechanism provided in the unloading and loading apparatus and, after opening of the cassette, temporarily contacts the X-ray film for exposure.

The erasing station is arranged such that cassette 1 before being loaded with another X-ray film and dispensed from the unloading and loading apparatus, is placed with its control contacts 9 into contact with erasing contact pieces of the erasing station whereby the data in display 7 of the LCD-unit 5 are erased.

Unit 15 provided for reading the patient data into the LCD-unit 5 of cassette 1 can be held in a data-transferring connection with the PC terminal of the X-ray department concerned and thus replace keyboard 13 if the patient data are filed in a central computer system of the hospital. If, on the other hand, each patient has his/her own patient ID card, the keyboard 13 can be replaced by a card-reading unit into which the patient ID card is inserted prior to X-ray exposure, said ID card possibly having a magnetic strip or some other machine-readable data source.

The unit 15 could be integrated into the X-ray apparatus, i.e. for example associated with the cassette-holding mechanism of an X-ray apparatus so that the reading of patient data into the LCD-unit 5 could take place directly during the X-ray treatment.

The above description and the drawing are confined to features which are essential to illustrate an embodiment of the invention. Inasmuch as such features are disclosed in the description and in the drawing but not mentioned in the claims they also serve if necessary to define the subject matter of

the invention.

## Claims

- 5 1. Method of identifying X-ray film with patient data wherein an X-ray film cassette and a patient data carrier associated with said cassette are used and wherein said X-ray film is exposed imagewise in an identification exposure to a pattern representing the data of the data carrier, **characterized** in that the data carrier used is an LCD-unit with memory characteristics, which is provided on the cassette and can be addressed from the exterior of the cassette and in that the data are machine-read from the data carrier and converted into control signals by means of which the identification exposure of the X-ray film is controlled.
- 10 2. Method according to claim 1, characterized in that an X-ray film cassette is used on which an LCD-unit is located on the outer wall and visible from outside.
- 15 3. Method according to claim 1 or 2, characterized in that an LCD-unit of the SMECTIC A type is used.
- 20 4. Method according to one of claims 1 to 3, characterized in that the LCD-unit is addressed for reading in of the patient data in a timed relationship or spatial connection with the carrying out of the radiographic X-ray exposure of the cassette.
- 25 5. Method according to one of claims 1 to 4, characterized in that the radiographically exposed cassette is inserted into an unloading and loading apparatus (multiloader) for unloading of the X-ray film, for developing it and for reloading the cassette and in that the patient data are read out from the LCD-unit by a data-reading unit associated with the unloading and loading apparatus.
- 30 6. Method according to claim 5, characterized in that the X-ray film is imagewise exposed with the pattern representing the patient data in the unloading and loading apparatus.
- 35 7. Method according to claim 5 or 6, characterized in that the LCD-unit of the cassette is addressed in the unloading and loading apparatus for erasure of patient data previously read in.
- 40 8. X-ray film cassette with a data carrier provided on its housing, into which patient data can be
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read in, characterized in that the data carrier used is an LCD-unit (5) with memory characteristics, said unit comprising control contacts (9) accessible on the outer wall (3) of cassette (1) and allowing the LCD-unit (5) to be addressed from the exterior of the cassette for reading-in and erasing of the patient data. 5

9. X-ray film cassette according to claim 8, characterized in that an LCD-unit (5) of the SMEC-TIC A type is provided. 10
10. X-ray film cassette according to claim 8 or 9, characterized in that the LCD-unit (5) is arranged on the outer wall (3) of cassette (1) such that the data read in are visible from the exterior of the cassette. 15
11. Unloading and loading apparatus for X-ray film cassettes with a data carrier for patient data, said apparatus having a light-tight inner space as well as means for opening X-ray film cassettes located in said inner space, means for removing the exposed X-ray film from the open cassettes, means for inserting another X-ray film into the open cassettes and means for developing the X-ray film removed from the cassettes, characterized in that said apparatus includes an exposure station for an imagewise identification exposure of the X-ray film of the open cassette (1) and in that the exposure station is controllable by control signals of a data-reading unit by means of which the patient data can be read from the data carrier of the cassettes (1). 20 25 30 35
12. Apparatus according to claim 11, characterized in that the data-reading unit is adapted for reading out alphanumerical data displayed by an LCD-unit (5). 40
13. Apparatus according to claim 11 or 12, characterized in that the exposure station includes a writing head with an LED-unit controllable by the control signals of the data-reading unit and serving for imagewise identification exposure of the X-ray film. 45

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